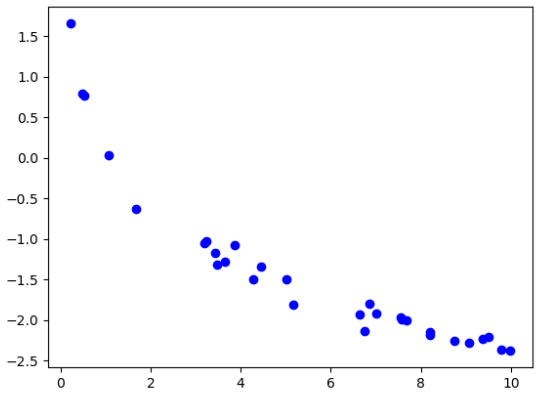
1. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Non-linear Power model

C. Linear model

D. Exponential model

E. None of the above

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2. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 140° *C and is placed into a* 13° *C bath to cool. After 38 minutes, the uranium has cooled to* 75° *C.*

A. $k = -0.02143$

B. $k = -0.01858$

C. $k = -0.01828$

D. $k = -0.01887$

E. None of the above

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3. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 1 hours, the petri dish has 18 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 254 minutes

   B. About 42 minutes

   C. About 221 minutes

   D. About 36 minutes

   E. None of the above

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4. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 800 grams of element X and after 4 years there is 160 grams remaining.

   A. About 1 day

   B. About 365 days

   C. About 730 days

   D. About 1460 days

   E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 243 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 325 minutes

   B. About 192 minutes

   C. About 32 minutes

   D. About 54 minutes

   E. None of the above

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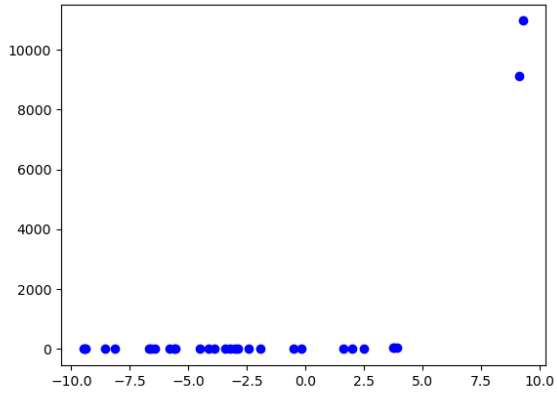
6. Determine the appropriate model for the graph of points below.



   A. Exponential model

   B. Non-linear Power model

   C. Logarithmic model

   D. Linear model

   E. None of the above

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7. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20120	20360	21080	23240	29720	49160	107480	282440	807320

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 170° *C and is placed into a* 17° *C bath to cool. After 30 minutes, the uranium has cooled to* 118° *C.*

A. $k = -0.02507$

B. $k = -0.02551$

C. $k = -0.01736$

D. $k = -0.04013$

E. None of the above

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9. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 510 grams of element X and after 6 years there is 72 grams remaining.

A. About 1 day

B. About 1095 days

C. About 2555 days

D. About 730 days

E. None of the above

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10. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89840	89360	87440	79760	49040	0	0	0	0

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above
